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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,062	07/08/2003	Hyug-Jin Kwon	29926/39496	8080

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EXAMINER

MACARTHUR, SYLVIA

ART UNIT PAPER NUMBER

1763

DATE MAILED: 07/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/615,062	<b>Applicant(s)</b> KWON, HYUG-JIN	
	<b>Examiner</b> Sylvia R. MacArthur	<b>Art Unit</b> 1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 15 October 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 July 2003 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/03/2006</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Terminal Disclaimer***

1. The terminal disclaimer filed on 4/28/2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of 10/331,729 has been reviewed and is accepted. The terminal disclaimer has been recorded.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1 and 5- 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA (applicant's admitted prior art, specifically Fig. 3A) in view of Kojima et al (US 5,766,498), Chen et al, and Hillman (US 5,997, 649).

Regarding claim 1: AAPA teaches a reaction chamber having a predetermined volume constituted with an upper plate 31A, lower plate 31B, and sidewalls 31C, see Fig. 3A; a rotating plate 35 loaded with a plurality of wafers, and a heating plate 33.

AAPA fails to teach a) a cooling plate attached to an upper surface of the upper plate and further that the upper surface is located outside of the reaction chamber.

b) a plasma excitement electrode at the entrance of the showerhead and between the cooling plate and the showerhead.

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Kojima et al teaches a showerhead electrode 3 detachable arranged at the lower end portion of cooling block 23. More specifically, the showerhead electrode comprise an electrode 54 and a cooling plate 53. The showerhead electrode is connected to an RF power supply 12. See col.3 lines 55-col.4 line 12. According to col. 5 lines 43-52, showerhead is a radial showerhead.

The motivation to modify the apparatus of AAPA is that the apparatus of Kojima et al offers a) a radial showerhead which enhances the distribution of gas entering the chamber b) a cooling plate near the showerhead to maintain and control the temperature of the inlet gases and c) an electrode which is coupled to the showerhead so that the inlet gases assist in plasma generation. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to combine the teachings of AAPA and Kojima et al.

The modification of AAPA in view of Kojima et al and Chen et al fails to teach that the upper surface of the cooling plate is outside of the reaction chamber.

Hillman teaches a cooling plate that is attached to an upper surface of the upper plate, the upper surface is located outside of the reaction chamber, see the abstract and Fig. 1.

Hillman notes in col. 6 lines 34-47 that the motivation to provide a cooling plate as discussed above is that a cooling plate located in the lid of the chamber controls the temperature of the reaction chamber and showerhead, thus providing a means of thermal process control of the semiconductor manufacturing process.

The modification of AAPA and the prior art by Kojima et al and Hillman fail to teach a showerhead with a cylinder and cone part.

Chen et al teaches a gas delivery apparatus for ALD. Figs. 1,3,and 11-13 teach a showerhead with a cylinder and cone-shaped part. The motivation to modify the apparatus of the AAPA and

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Kojima et al and Hillman et al further with the teachings of Kojima et al are that the shape of the showerhead provides for a more improved radial flow of the treatment gas see [011] of Chen et al. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to modify the apparatus AAPA modified by Kojima et al and Hillman and further modified by Chen et al.

Regarding claim 5: See Figs. 5 and 6 of Chen et al.

Regarding claim 6: A distance is illustrated between the showerhead and the rotating plate. However, the AAPA fails to specifically teach that the distance is 3.5 mm to about 7 mm. According to *In re Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984), the Federal Circuit held that, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. Thus, it would have been obvious for one of ordinary skill in the art to modify the apparatus of AAPA modified by Kojima et al and Hillman et al to provide a distance of 3.5 mm to 7 mm between the showerhead and the rotating plate in order to provide ample spacing for the cultivation of plasma and thus promote the optimal deposition layer.

Regarding claim 7: AAPA chamber is a ALD (reaction) chamber 10, Thus, an atomic layer is deposited onto a wafer. In order to clean the chamber, chlorine gas is used to clean line 32A and Ar gas is used to prevent deposition of process gas onto the underside surface of the rotating plate. See page 6 lines 4-15 of the specification.

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Regarding claim 8: Col. 4 lines 45-52 teaches that the power level of the RF supply is about 50 to 3000 W. The amount of power supplied to the electrode is an optimizable processing parameter. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide the amount of power to the electrode that generates the optimal plasma for the ALD or cleaning process.

Regarding claim 9: The cleaning gas is a mixture of chlorine gas and argon gas, however each gas is injected separately as illustrates in Fig. 3A, see specification page 6 lines 3-15.

4. Claims 2,3,10,12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Kojima et al, Hillman, and Chen et al as applied to claims 1 and 6-9 above, and further in view of Satou et al (US 4,676,194).

The teachings of AAPA modified by Kojima et al and Chen et al were discussed above.

Regarding claims 2 and 10: AAPA modified by Kojima et al and Chen et al fails to teach an ion extraction electrode.

Satou et al teaches an apparatus for thin film formation. An ion extraction electrode 25 is provided at the exhaust of the gas introduction tube 22. The motivation to provide the ion extraction tube is for extracting ions generated in the plasma generating zone into the accelerating zone 19, see col. 3 lines 60-65. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide an ion extraction electrode in the apparatus that results from the combined teachings of AAPA in view of Kojima et al and Chen et al .

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Regarding claim 3: Col.4 lines 15 and 16 teaches that the ion extraction electrode uses a DC power supply 30.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Kojima et al, Hillman, and Chen et al as applied to claims 1 and 6-9 above, and further in view of Dunham (US 6,626,998).

The teachings of AAPA modified by Kojima et al and Chen et al were discussed above.

AAPA modified by Kojima et al and Chen et al fails to teach that the plasma excitation electrode is constructed in a ring-type structure.

Dunham teaches a plasma generator. The abstract cites that the showerhead comprises an electrode ring 37. The motivation to provide the apparatus of AAPA modified by Kojima et al and Chen et al is that it requires minimum metal from metal insulation procedures and yet generate and maintain uniform charged plasma. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide a ring-shaped electrode near the showerhead to enhance plasma generation.

6. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA in view of Kojima et al, Hillman, and Chen et al as applied to claims 1 and 6-9 above, and further in view of Mena (US 5,518,572).

The teachings of AAPA modified by Kojima et al and Chen et al are discussed above.

AAPA modified by Kojima et al fails to teach that the exhaust of the radial showerhead head has an angle.

Mena teaches plasma processing system and method. The method teaches an ion extraction electrode 218 and 22 wherein the power supplied to them is -50V and -80V

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respectively, see col. 20 lines 58-64. The amount of voltage supplied to the electrode is an optimizable processing parameter. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide the amount of voltage to the electrode that generates the optimal plasma for the ALD or cleaning process.

***Response to Arguments***

7. Applicant's arguments with respect to claims 1-13 have been considered but are moot in view of the new ground(s) of rejection. The prior art by Hillman et al teaches a cooling plate attached to an upper surface of the upper plate, the upper surface being located on the outside of the chamber.

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.



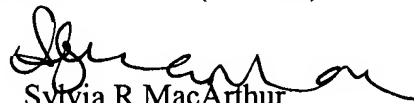
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8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438.

The examiner can normally be reached on M-F during the hours of 8:30 a.m. and 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Sylvia R MacArthur  
Patent Examiner  
Art Unit 1763

July 7, 2006

  
**PARVIZ HASSANZADEH**  
**SUPERVISORY PATENT EXAMINER**